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eler may advisedly remain an entire year in its wholesome atmosphere while writing his account of an accomplished journey. Can you not see that the school will thus become a notable center of geographical activity if its development follow serious professional lines? It will inevitably become such a center, and it will thereby exert a greatly needed and most beneficent influence on the cultivation of scientific geography all over our country. That the beginning now made should have some such consummation is my devout wish. When that wish is realized, then wherever geography is seriously spoken of in America, the speaker and his hearers will find themselves thinking spontaneously of the Graduate School of Geography at Clark University.

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THE RESEARCHES OF ALFRED GOLDSBOROUGH MAYOR

ALFRED G. MAYOR brought to research an unusual personality. He had an extraordinary artistic sense both for color and form; he had a training in physics and engineering in accordance with a parental desire; he had the brilliancy in conversation that made him an excellent companion on expeditions or after work hours; he had a capacity for meeting people of all kinds and conditions—whether in social events in cities or among the natives of the shore of Torres Straits; and he had an industry that outran his strength.

After graduating from Stevens Institute he went to Clark University as assistant to Professor Michelson, and then to the University of Kansas where he taught physics for parts of two years. While there he made biophysical studies on leaves, and published the results after going to Harvard. Mayor's artistic sense lured him to study animals. He had as a boy made the most beautiful paintings of butterflies of iridescent types which looked as though their wings had been pasted on the page. His first research at Harvard was on the development of the wing scales and their pigment in butterflies and moths (1896) and this was quickly followed by a contribution of

87 pages and 10 (for the most part colored) plates "On the color and pattern of moths and butterflies." These papers revealed three major interests of the author: (a) a fine artistic sense, with a special attraction toward color; (b) a tendency to make crucial experiments to test mooted points; and (c) a fondness for physical experimentation. Thus he used in these researches the spectroscope to study the pigments and a pendulum to determine the friction of wing scales on the air. In the latter experiment on butterflies the wings were studied with their scales on and also removed. The later paper stimulated Alfred R. Wallace to discuss it in *Nature*.

Five years later Mayor published further researches on Lepidoptera and analyzed the elements of their color patterns. He returned again to the Lepidoptera in 1906, when he published a paper with Miss Soule on some reactions of caterpillars and moths. He studied not only their reactions to light, food and gravity and their feeding habits but continued the studies he had begun six years earlier on mate selection. Wings of males were painted with scarlet or green ink; and males were variously maimed. Color made no difference with matings but the maimed males met more resistance than normals to copulation unless the female was blinded.

Mayor had not been long at the museum in Cambridge before his artistic work attracted the attention of Alexander Agassiz and led to an invitation to him to accompany Agassiz on his trip to the Bahamas in Mr. Forbes' yacht *Wild Duck* in 1893. This was the first of a series of voyages with Agassiz up to 1900; to the Great Barrier Reef of Australia in 1896; to the Fiji Islands in 1897-8; to the tropical Pacific on the *Albatross* in 1899-1900. On these voyages Mayor made drawings and observations on radiates—especially the Medusæ. These fascinated him as they did that other artist-naturalist, Haeckel. The outcome of these studies and those of later years appeared eventually in Mayor's "Medusæ of the World" and "Ctenophores of the Atlantic," published by the Carnegie Institution and illustrated by scores of plates drawn by his own hand and brush. To this period belonged

his discovery of the "Atlantic Palolo" and his study on the Partulas of Tahiti.

In 1900 Mayor entered on a new phase of work. He was appointed curator of natural science at the new Brooklyn Museum and, in 1904, curator-in-chief. Here he devoted himself to arranging the rapidly increasing collections; and he also continued his studies on Lepidoptera and Medusæ. But museum work was too static for this experimental naturalist. He agitated the establishment of a marine laboratory at the Tortugas (SCIENCE, January 30, 1903) and found the American biologists strongly favored the plan. So it was natural that when the Carnegie Institution of Washington was casting about for the best projects to support it should adopt this and its principal sponsor, Dr. Mayor. In 1905 he published a book, "Sea Shore Life," of which he unselfishly turned the copyright over to the New York Zoological Society; just as he turned over the problem of the Partulas of Tahiti to Dr. H. E. Crampton; and just as he generously gave unsparingly of his time and ideas to others.

And now began a new era in Mayor's life. He erected in July, 1904, laboratory buildings at Loggerhead Key, Florida, and sailed thence from Maine to the Tortugas in the new 57-foot auxiliary ketch, the *Physalia*. Besides providing for the physical care and scientific needs of the zoologists that gathered at the laboratory, Mayor plunged into scientific work. In it he combined his special knowledge of jelly fishes with his fondness for physical and chemical experimentation and showed that rhythmical pulsation may be initiated and maintained independently of the nervous system. During the following seasons he made fundamental studies on the effect of different ions. Thus Mg is stupefying and the NaCl, K and Ca and sea water resist its stupefying effect; many ions have the opposite effect on muscles from that on cilia.

In 1909 the series of "Papers from the Tortugas Laboratory" began to appear, of which 15 large volumes have been published. It took a lot of pertinacious endeavor and much tact on the part of the director to secure a prompt publication of results.

In 1913-14 Mayor made an expedition to Thursday Islands and Murray Islands in Torres Straits, where studies were made on coral reefs, and where he found clear evidence of solution of limestone on the reefs. A summary of the first ten years of work of his department is given in Mayor's report in the *Yearbook* of the Institution for 1914.

Already it had begun to appear that the Tortugas must be abandoned as the permanent site of the laboratory, on account of its destructive hurricanes and its isolation; so Mayor visited numerous other islands to find a better site; also more studies were undertaken in the Pacific Ocean on coral reefs, especially at American Samoa. Later studies were made here upon the theory of coral reef building.

The war seriously interfered with Mayor's scientific work for a year or two—when he was giving much time to instructing naval recruits in navigation. Returning to Samoa in 1919 he demonstrated that the present living coral reefs are not superimposed upon ancient reefs but have simply grown outward from the shore slopes since post-glacial times. Mayor made observations and photographs of corals down to 8.5 fathoms by the use of a diving hood, and it was probably in connection with this trying experience that his resistance was weakened and that illness was started which resulted in his death.

Mayor's scientific influence is not confined to his personal researches; to his activity must be largely ascribed the results of Vaughan's studies on growth of corals, of Bartsch's on hybridization in *Cerion*, of Drew's on the origin of limestone deposits through bacterial action, of Harvey's on phosphorescent light; and many other researches. The hope may be expressed that since the department which Mayor founded has so amply justified itself the man and means will be found to continue it.

CHAS. B. DAVENPORT

A SCIENTIFIC EXPEDITION TO THE ISLANDS OFF THE WEST COAST OF LOWER CALIFORNIA

THE most important expedition sent out by the California Academy of Sciences this year has sailed from San Diego for a two months'